



- ☐ Tentative Specification  
☐ Preliminary Specification  
☒ Approval Specification

**MODEL NO.: V460H1**  
**SUFFIX: PE5**

**Customer:**

**CONFIRMED BY**

**SIGNATURE**

Name / Title

**APPROVED BY**

SIGNATURE

Name / Title

**Note**

Please return 1 copy for your confirmation with your signature and comments.

| Approved By     | Checked By | Prepared By |
|-----------------|------------|-------------|
| Chao-Chun Chung | Ken Wu     | Jim Ho      |

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**REVISION HISTORY**

| Version  | Date         | Page(New) | Section | Description                                  |
|----------|--------------|-----------|---------|----------------------------------------------|
| Ver. 2.0 | Oct 12, 2010 | All       | All     | The approval specification was first issued. |
| Ver. 2.1 | Oct 09, 2010 | p.7       | 2.2     | ABSOLUTE RATINGS OF ENVIRONMENT(OPEN CELL)   |
|          |              | p.10      | 3.3     | SPWB INFORMATION was revised                 |
|          |              | p.12      | 4.1     | Revise the CN2 (XR ) to CN1(XL)              |
|          |              | p.19      | 5.1     | Add the Data arrangement of Flip pixel -1    |
|          |              | p.32      | 11      | Mechanical characteristic                    |

**1. GENERAL DESCRIPTION****1.1 OVERVIEW**

V460H1-PE5 is a 46" TFT Liquid Crystal Display product with driver ICs and 4 path- 6 pair mini-LVDS interface.  
This product supports 1920 x 1080 Full HDTV format and can display 1G colors (10 bit/FRC). The backlight unit is not built in.

**1.2 FEATURES**

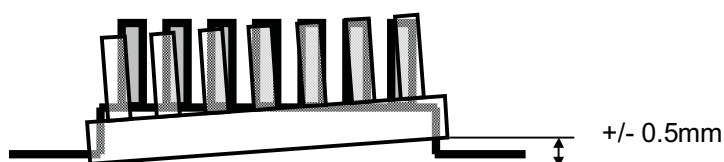
| CHARACTERISTICS ITEMS             | SPECIFICATIONS                                                                                                                        |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Screen Diagonal [in]              | 46                                                                                                                                    |
| Pixels [lines]                    | 1920 × 1080                                                                                                                           |
| Active Area [mm]                  | 1018.08(H) × 572.67(V) (46" diagonal)                                                                                                 |
| Sub-Pixel Pitch [mm]              | 0.17675(H) × 0.53025(V))                                                                                                              |
| Pixel Arrangement                 | RGB vertical stripe                                                                                                                   |
| Weight [g]                        | TYP. 2450g                                                                                                                            |
| Physical Size [mm]                | 615.32(W) × 1058.58 (H) × 1.78(D) Typ.                                                                                                |
| Display Mode                      | Transmissive mode / Normally black                                                                                                    |
| Contrast Ratio                    | 5000:1 Typ.<br>(Typical value measure at CMI's module)                                                                                |
| Glass thickness (Array / CF) [mm] | 0.7 / 0.7                                                                                                                             |
| Viewing Angle (CR>20)             | +88/-88(H), +88/-88(V) Typ. (CR ≥ 20)<br>(Typical value measure at CMI's module)                                                      |
| Color Chromaticity                | R = (0.650, 0.323)<br>G = (0.257, 0.583)<br>B = (0.134, 0.101)<br>W= (0.289, 0.335)<br>* Please refer to "color chromaticity" on p.21 |
| Cell Transparency [%]             | 4.8%                                                                                                                                  |
| Polarizer Surface Treatment Spec  | Anti-Glare coating (Haze 11%),<br>Hard coating :(3H) (CF Side),(6B) (TFT Side)                                                        |

**1.3 MECHANICAL SPECIFICATIONS**

| Item                            | Min.                                                                                                           | Typ. | Max. | Unit | Note |
|---------------------------------|----------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Weight                          | 2350                                                                                                           | 2450 | 2550 | g    | -    |
| I/F connector mounting position | The mounting inclination of the connector makes the screen center within $\pm 0.5\text{mm}$ as the horizontal. |      |      |      | (2)  |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position



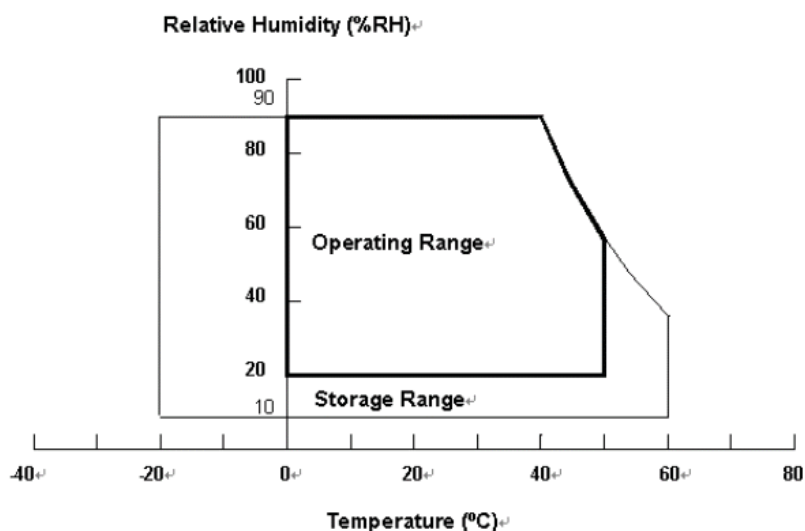
**2. ABSOLUTE MAXIMUM RATINGS****2.1 ABSOLUTE RATINGS OF ENVIRONMENT**

| Item                          | Symbol | Value |      | Unit | Note                           |
|-------------------------------|--------|-------|------|------|--------------------------------|
|                               |        | Min.  | Max. |      |                                |
| Storage Temperature           | TST    | -20   | +60  | °C   | (1)<br>With CMI<br>Module      |
| Operating Ambient Temperature | TOP    | 0     | 50   | °C   | (1), (2)<br>With CMI<br>Module |

Note (1) Temperature and relative humidity range is shown in the figure below.

- (a) 90 %RH Max. ( $T_a \leq 40\text{ }^{\circ}\text{C}$ ).
- (b) Wet-bulb temperature should be 39 °C Max. ( $T_a > 40\text{ }^{\circ}\text{C}$ ).
- (c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.



**2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)**

Recommended Storage Condition: With shipping package.

Recommended Storage temperature range: 25±5 °C

Recommended Storage humidity range: 50±10%RH

Recommended Shelf life: a month

**2.3 ELECTRICAL ABSOLUTE RATINGS****2.3.1 TFT LCD OPEN CELL**

| Item                          | Symbol    | Value |      | Unit | Note |
|-------------------------------|-----------|-------|------|------|------|
|                               |           | Min.  | Max. |      |      |
| Voltage for gate driver       | VGH       | -0.3  | 40   | V    |      |
| Voltage for gate driver       | VGL       | -20   | 0.3  | V    |      |
| Voltage range for gate driver | VGH - VGL | -0.3  | 43   | V    |      |
| Voltage for data diver        | VAA       | 12    | 18   | V    |      |
| Logic Input Voltage           | VIN       | -0.3  | 5    | V    |      |

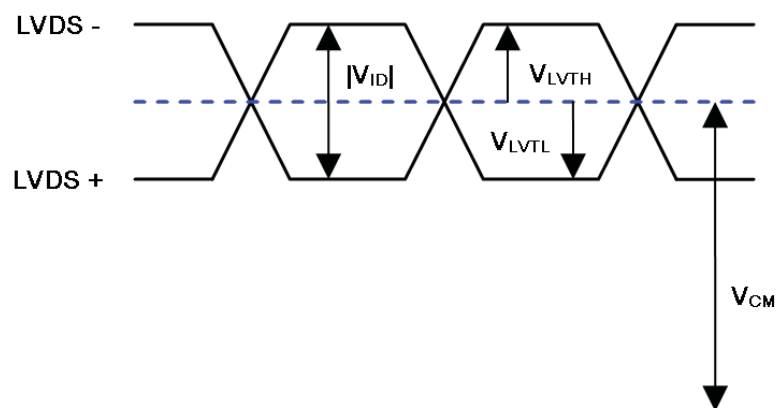
### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 TFT LCD OPEN CELL

(Ta = 25 ± 2 °C)

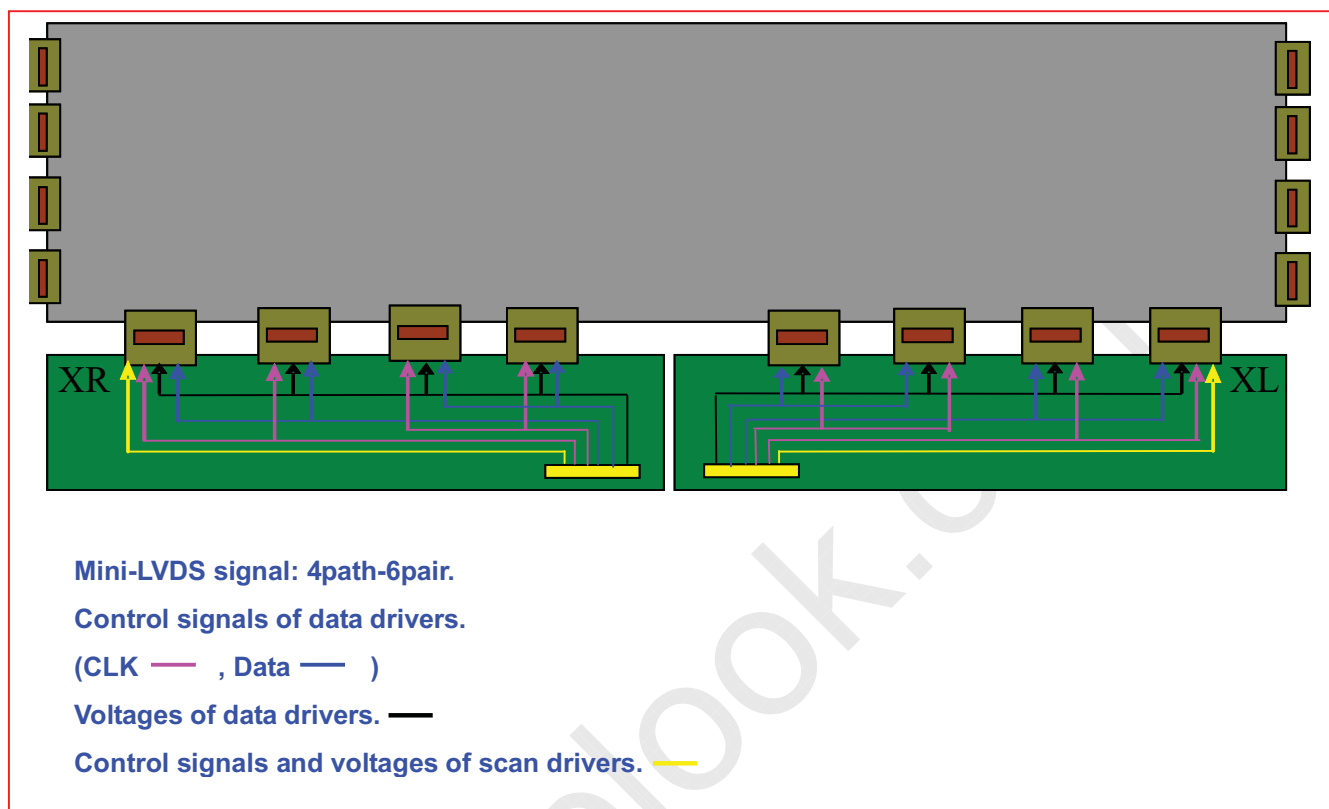
| Parameter                     |                                           | Symbol            | Value |      |      | Unit | Note |
|-------------------------------|-------------------------------------------|-------------------|-------|------|------|------|------|
|                               |                                           |                   | Min.  | Typ. | Max. |      |      |
| Voltage for gate driver       |                                           | VGH               | 29    | 30   | 31   | V    |      |
| Voltage for gate driver       |                                           | VGL               | -7.7  | -8   | -8.3 | V    |      |
| Voltage range for gate driver |                                           | VGH - VGL         | 36.7  | 38   | 39.3 | V    |      |
| Voltage for data driver       |                                           | VAA               | 17.4  | 17.7 | 18   | V    |      |
| Voltage for data driver       |                                           | VAAM              | 8.6   | 8.9  | 9.2  | V    |      |
| Mini- LVDS interface          | Differential Input High Threshold Voltage | V <sub>LVTH</sub> | +100  | —    | —    | mV   | (1)  |
|                               | Differential Input Low Threshold Voltage  | V <sub>LVTL</sub> | —     | —    | -100 | mV   |      |
|                               | Common Input Voltage                      | V <sub>CM</sub>   | 1.0   | 1.2  | 1.4  | V    |      |
|                               | Differential input voltage                | V <sub>ID</sub>   | 200   | —    | 600  | mV   |      |
|                               | Terminating Resistor                      | R <sub>T</sub>    | —     | 100  | —    | ohm  |      |
| CMOS interface                | Input High Threshold Voltage              | V <sub>IH</sub>   | 2.7   | —    | 3.3  | V    |      |
|                               | Input Low Threshold Voltage               | V <sub>IL</sub>   | 0     | —    | 0.7  | V    |      |

Note (1) The Mini- LVDS input characteristics are as follows:





## 3.2 CIRCUIT AND WIRING DIAGRAM OF SPWB





## 3.3 SPWB INFORMATION

|              | Parts Name                        | M't Vender                                                                                                         | Manufacturer            | Type           | Flame Class | UL File                          |
|--------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------|----------------|-------------|----------------------------------|
| Source Board | Wiring, PCB for Source board (XL) | USI<br>(Universal Scientific Industrial Corp.)<br>TSMT (Alternative)<br>(Taiwan Surface Mounting technology Corp.) | Dynamic                 | M0-V0<br>KM-V0 | 94V-0       | E150630(TW)<br>E255400((KunShan) |
|              |                                   |                                                                                                                    | Tripod<br>(Alternative) | 2-9            | 94V-0       | E222034                          |
|              |                                   |                                                                                                                    | TPT<br>(Alternative)    | MV-0<br>MV-QS  | 94V-0       | E88441                           |
| Source Board | Wiring, PCB for Source board (XR) | USI<br>(Universal Scientific Industrial Corp.)<br>TSMT (Alternative)<br>(Taiwan Surface Mounting technology Corp.) | Dynamic                 | M0-V0<br>KM-V0 | 94V-0       | E150630(TW)<br>E255400((KunShan) |
|              |                                   |                                                                                                                    | Tripod<br>(Alternative) | 2-9            | 94V-0       | E222034                          |
|              |                                   |                                                                                                                    | TPT<br>(Alternative)    | MV-0<br>MV-QS  | 94V-0       | E88441                           |
| T-con Board  | Wiring, PCB for TFT control board | USI<br>(Universal Scientific Industrial Corp.)<br>TSMT (Alternative)<br>(Taiwan Surface Mounting technology Corp.) | Dynamic                 | M0-V0<br>KM-V0 | 94V-0       | E150630(TW)<br>E255400((KunShan) |
|              |                                   |                                                                                                                    | Tripod<br>(Alternative) | 2-9            | 94V-0       | E222034                          |
|              |                                   |                                                                                                                    | TPT<br>(Alternative)    | MV-0<br>MV-QS  | 94V-0       | E88441                           |
|              |                                   |                                                                                                                    |                         |                |             |                                  |
|              | Parts Name                        | Manufacturer                                                                                                       | Type                    |                | Flame Class | UL File                          |
| FPC          | Source COF(NT39935DH-C5226A)      | Toray-Dupont                                                                                                       | 150EN                   |                | 94V-0       | E73117                           |
|              | Gate COF(NT39530H-C5208A)         | Toray-Dupont                                                                                                       | 150EN                   |                | 94V-0       | E73117                           |
|              | Source COF(HX8159-A010CBO7)       | Toray-Dupont                                                                                                       | 150EN                   |                | 94V-0       | E73117                           |
|              | Gate COF(HX8658C00BCBMM)          | Toray-Dupont                                                                                                       | 150EN                   |                | 94V-0       | E73117                           |

**4. INPUT TERMINAL PIN ASSIGNMENT****4.1 TFT LCD OPEN CELL****CN1 ( XL ) Connector Pin Assignment : P-TWO 196225-80041**

| Pin | Name   | Description                 | Note |
|-----|--------|-----------------------------|------|
| 1   | GND    | Ground                      |      |
| 2   | MLB6N  | Mini-LVDS data signal-      |      |
| 3   | MLB6P  | Mini-LVDS data signal+      |      |
| 4   | MLB5N  | Mini-LVDS data signal-      |      |
| 5   | MLB5P  | Mini-LVDS data signal+      |      |
| 6   | MLB4N  | Mini-LVDS data signal-      |      |
| 7   | MLB4P  | Mini-LVDS data signal+      |      |
| 8   | GND    | Ground                      |      |
| 9   | MLBCKN | Mini-LVDS clock signal-     |      |
| 10  | MLBCKP | Mini-LVDS clock signal+     |      |
| 11  | GND    | Ground                      |      |
| 12  | MLB2N  | Mini-LVDS data signal-      |      |
| 13  | MLB2P  | Mini-LVDS data signal+      |      |
| 14  | MLB1N  | Mini-LVDS data signal-      |      |
| 15  | MLB1P  | Mini-LVDS data signal+      |      |
| 16  | MLB0N  | Mini-LVDS data signal-      |      |
| 17  | MLB0P  | Mini-LVDS data signal+      |      |
| 18  | GND    | Ground                      |      |
| 19  | MLA6N  | Mini-LVDS data signal-      |      |
| 20  | MLA6P  | Mini-LVDS data signal+      |      |
| 21  | MLA5N  | Mini-LVDS data signal-      |      |
| 22  | MLA5P  | Mini-LVDS data signal+      |      |
| 23  | MLA4N  | Mini-LVDS data signal-      |      |
| 24  | MLA4P  | Mini-LVDS data signal+      |      |
| 25  | GND    | Ground                      |      |
| 26  | MLACKN | Mini-LVDS clock signal-     |      |
| 27  | MLACKP | Mini-LVDS clock signal+     |      |
| 28  | GND    | Ground                      |      |
| 29  | MLA2N  | Mini-LVDS data signal-      |      |
| 30  | MLA2P  | Mini-LVDS data signal+      |      |
| 31  | MLA1N  | Mini-LVDS data signal-      |      |
| 32  | MLA1P  | Mini-LVDS data signal+      |      |
| 33  | MLA0N  | Mini-LVDS data signal-      |      |
| 34  | MLA0P  | Mini-LVDS data signal+      |      |
| 35  | GND    | Ground                      |      |
| 36  | GND    | Ground                      |      |
| 37  | OE1    | Scan driver output enable   |      |
| 38  | OE2    | Scan driver output enable   |      |
| 39  | CKV    | Scan driver clock           |      |
| 40  | POL    | Data driver polarity invert |      |
| 41  | NC     | No connection               |      |
| 42  | STV    | Scan driver start pulse     |      |
| 43  | TP1    | Data driver data latch      |      |
| 44  | NC     | No connection               |      |
| 45  | EIO4   | 4path selection pin (3.3V)  |      |
| 46  | VDASEL | Half VAA selection          |      |
| 47  | GND    | Ground                      |      |
| 48  | GM18   | Gamma voltage               |      |
| 49  | GM17   | Gamma voltage               |      |
| 50  | GM16   | Gamma voltage               |      |



|    |      |                      |  |
|----|------|----------------------|--|
| 51 | GM15 | Gamma voltage        |  |
| 52 | GM14 | Gamma voltage        |  |
| 53 | GM13 | Gamma voltage        |  |
| 54 | GM12 | Gamma voltage        |  |
| 55 | GM10 | Gamma voltage        |  |
| 56 | GM9  | Gamma voltage        |  |
| 57 | GM7  | Gamma voltage        |  |
| 58 | GM6  | Gamma voltage        |  |
| 59 | GM5  | Gamma voltage        |  |
| 60 | GM4  | Gamma voltage        |  |
| 61 | GM3  | Gamma voltage        |  |
| 62 | GM2  | Gamma voltage        |  |
| 63 | GM1  | Gamma voltage        |  |
| 64 | GND  | Ground               |  |
| 65 | VAAM | Half VAA voltage     |  |
| 66 | VAAM | Half VAA voltage     |  |
| 67 | GND  | Ground               |  |
| 68 | VCM  | VCOM voltage         |  |
| 69 | VCM  | VCOM voltage         |  |
| 70 | GND  | Ground               |  |
| 71 | VAA  | VAA voltage          |  |
| 72 | VAA  | VAA voltage          |  |
| 73 | GND  | Ground               |  |
| 74 | VDD  | Logic power          |  |
| 75 | VDD  | Logic power          |  |
| 76 | VGL  | Scan driver voltage  |  |
| 77 | VGL  | Scan driver voltage  |  |
| 78 | VGH  | Scan driver voltage  |  |
| 79 | VGH  | Scand driver voltage |  |
| 80 | GND  | Ground               |  |

**CN1 ( XR ) Connector Pin Assignment : P-TWO 196225-80041**

| Pin | Name   | Description                | Note |
|-----|--------|----------------------------|------|
| 1   | GND    | Ground                     |      |
| 2   | VGH    | Scan driver voltage        |      |
| 3   | VGH    | Scan driver voltage        |      |
| 4   | VGL    | Scan driver voltage        |      |
| 5   | VGL    | Scand driver voltage       |      |
| 6   | VDD    | Logic power                |      |
| 7   | VDD    | Logic power                |      |
| 8   | GND    | Ground                     |      |
| 9   | VAA    | VAA voltage                |      |
| 10  | VAA    | VAA voltage                |      |
| 11  | GND    | Ground                     |      |
| 12  | VCM    | VCOM voltage               |      |
| 13  | VCM    | VCOM voltage               |      |
| 14  | GND    | Ground                     |      |
| 15  | VAAM   | Half VAA voltage           |      |
| 16  | VAAM   | Half VAA voltage           |      |
| 17  | GND    | Ground                     |      |
| 18  | NC     | No connection              |      |
| 19  | VDASEL | Half VAA selection         |      |
| 20  | EIO4   | 4path selection pin (3.3V) |      |
| 21  | NC     | No connection              |      |
| 22  | TP1    | Data driver data latch     |      |



|    |        |                             |  |
|----|--------|-----------------------------|--|
| 23 | STV    | Scan driver start pulse     |  |
| 24 | NC     | No connection               |  |
| 25 | POL    | Data driver polarity invert |  |
| 26 | CKV    | Scan driver clock           |  |
| 27 | OE2    | Scan driver output enable   |  |
| 28 | OE1    | Scan driver output enable   |  |
| 29 | GND    | Ground                      |  |
| 30 | MLD6N  | Mini-LVDS data signal-      |  |
| 31 | MLD6P  | Mini-LVDS data signal+      |  |
| 32 | MLD5N  | Mini-LVDS data signal-      |  |
| 33 | MLD5P  | Mini-LVDS data signal+      |  |
| 34 | MLD4N  | Mini-LVDS data signal-      |  |
| 35 | MLD4P  | Mini-LVDS data signal+      |  |
| 36 | GND    | Ground                      |  |
| 37 | MLDCKN | Mini-LVDS clock signal-     |  |
| 38 | MLDCKP | Mini-LVDS clock signal+     |  |
| 39 | GND    | Ground                      |  |
| 40 | MLD2N  | Mini-LVDS data signal-      |  |
| 41 | MLD2P  | Mini-LVDS data signal+      |  |
| 42 | MLD1N  | Mini-LVDS data signal-      |  |
| 43 | MLD1P  | Mini-LVDS data signal+      |  |
| 44 | MLD0N  | Mini-LVDS data signal-      |  |
| 45 | MLD0P  | Mini-LVDS data signal+      |  |
| 46 | GND    | Ground                      |  |
| 47 | MLC6N  | Mini-LVDS data signal-      |  |
| 48 | MLC6P  | Mini-LVDS data signal+      |  |
| 49 | MLC5N  | Mini-LVDS data signal-      |  |
| 50 | MLC5P  | Mini-LVDS data signal+      |  |
| 51 | MLC4N  | Mini-LVDS data signal-      |  |
| 52 | MLC4P  | Mini-LVDS data signal+      |  |
| 53 | GND    | Ground                      |  |
| 54 | MLCCKN | Mini-LVDS clock signal-     |  |
| 55 | MLCCKP | Mini-LVDS clock signal+     |  |
| 56 | GND    | Ground                      |  |
| 57 | MLC2N  | Mini-LVDS data signal-      |  |
| 58 | MLC2P  | Mini-LVDS data signal+      |  |
| 59 | MLC1N  | Mini-LVDS data signal-      |  |
| 60 | MLC1P  | Mini-LVDS data signal+      |  |
| 61 | MLC0N  | Mini-LVDS data signal-      |  |
| 62 | MLC0P  | Mini-LVDS data signal+      |  |
| 63 | GND    | Ground                      |  |
| 64 | GM18   | Gamma voltage               |  |
| 65 | GM17   | Gamma voltage               |  |
| 66 | GM16   | Gamma voltage               |  |
| 67 | GM15   | Gamma voltage               |  |
| 68 | GM14   | Gamma voltage               |  |
| 69 | GM13   | Gamma voltage               |  |
| 70 | GM12   | Gamma voltage               |  |
| 71 | GM10   | Gamma voltage               |  |
| 72 | GM9    | Gamma voltage               |  |
| 73 | GM7    | Gamma voltage               |  |
| 74 | GM6    | Gamma voltage               |  |
| 75 | GM5    | Gamma voltage               |  |
| 76 | GM4    | Gamma voltage               |  |
| 77 | GM3    | Gamma voltage               |  |
| 78 | GM2    | Gamma voltage               |  |

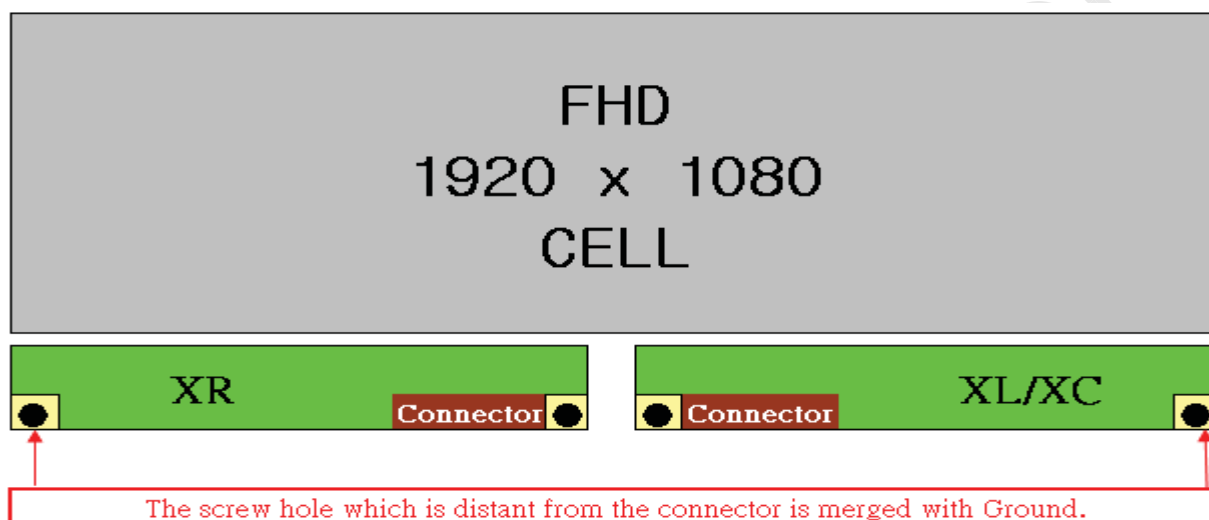
|    |     |               |  |
|----|-----|---------------|--|
| 79 | GM1 | Gamma voltage |  |
| 80 | GND | Ground        |  |

Note (1) VDA select: Half/Full VAA operating range selection.

Low = Connect to GND, High = Connect to +3.3V

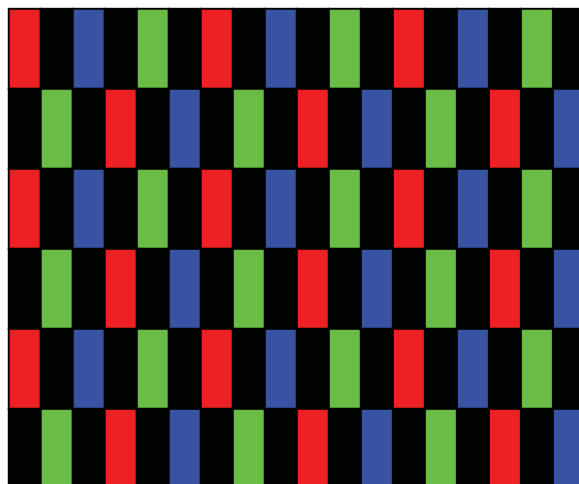
| VDA SEL | Note     |
|---------|----------|
| L       | Full VAA |
| H       | Half VAA |

Note (2) The screw hole which is distant from the connector is merged with Ground



**4.2 FLICKER (Vcom) ADJUSTMENT****(1) Adjustment Pattern:**

Sub-pixel on-off pattern was shown as below. If customer need below pattern, please directly contact with Account FAE.

**(2) Adjustment method: (Digital V-com)**

Programmable memory IC is used for Digital V-com adjustment in this model. CMI provide Auto Vcom tools to adjust Digital V-com. The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com adjustment OI. Below items is suggested to be ready before Digital V-com adjustment in customer LCM line.

- a. USB Sensor Board.
- b. Programmable software.

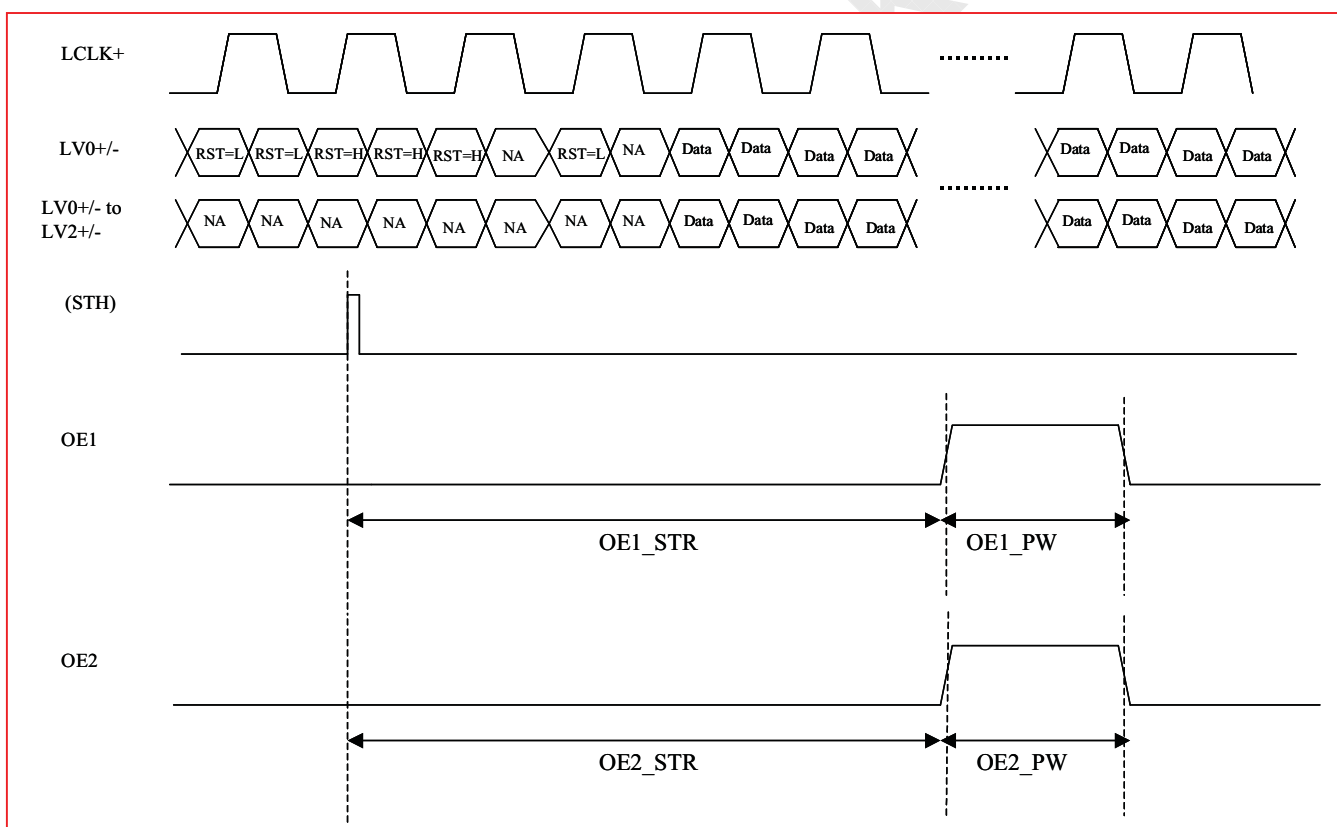
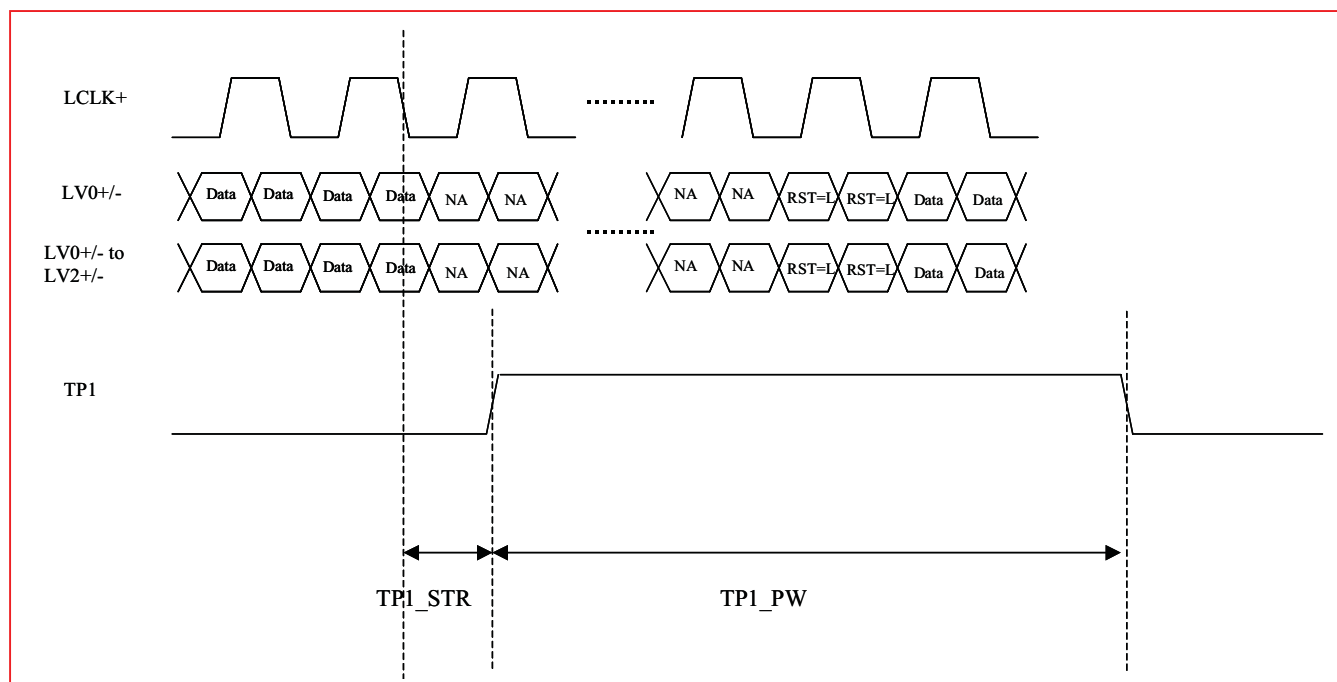
**5. INTERFACE TIMING****5.1 INPUT SIGNAL TIMING SPECIFICATIONS**

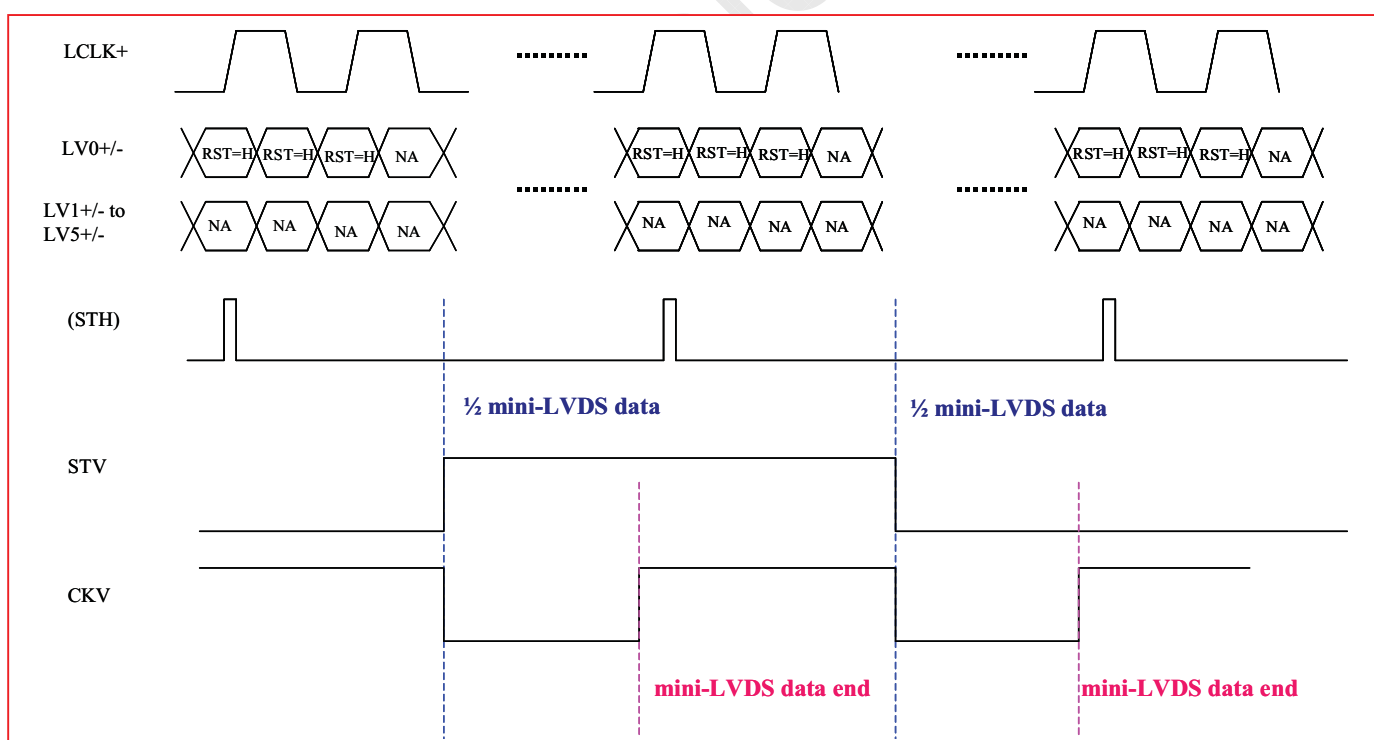
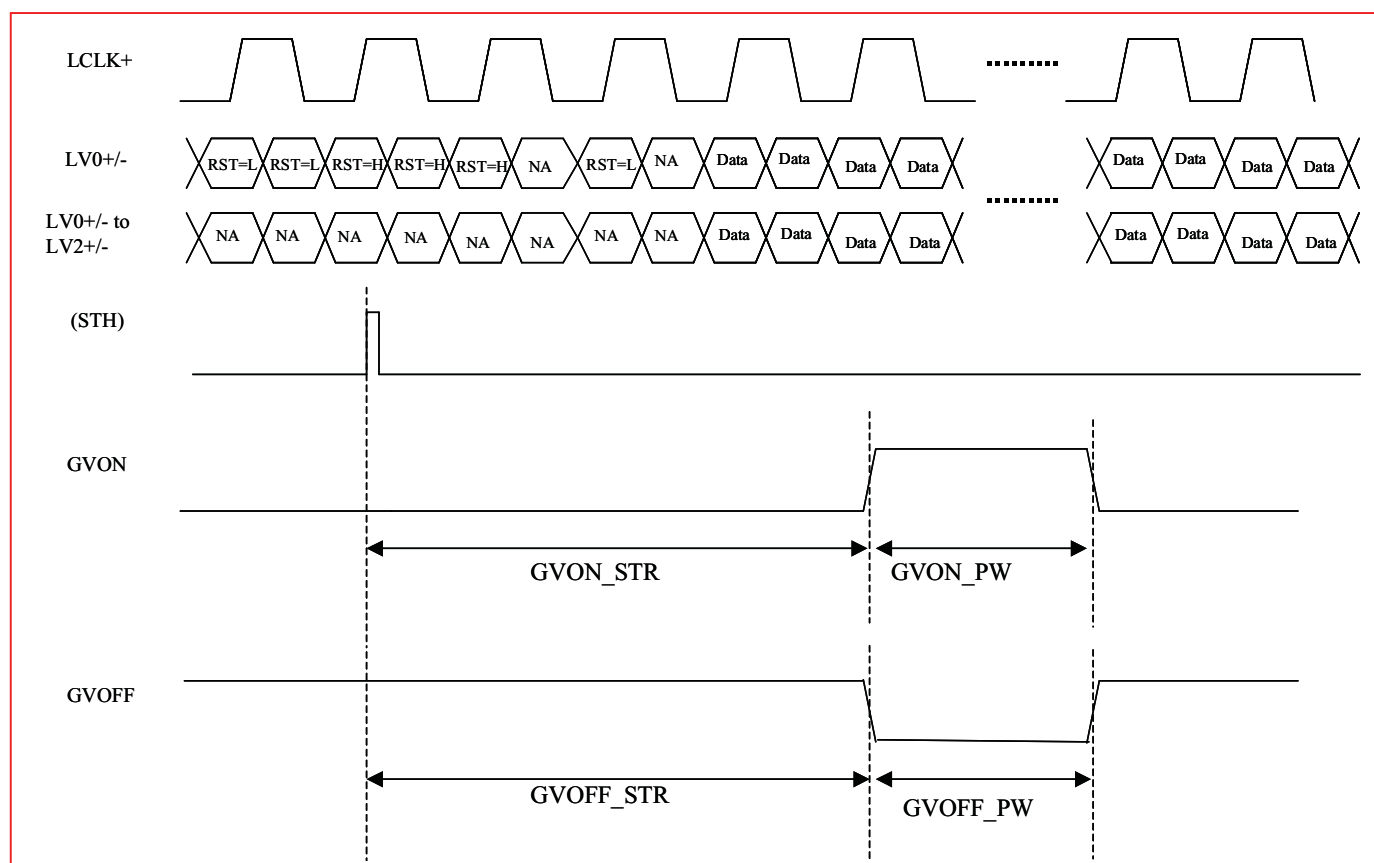
(Ta = 25 ± 2 °C)

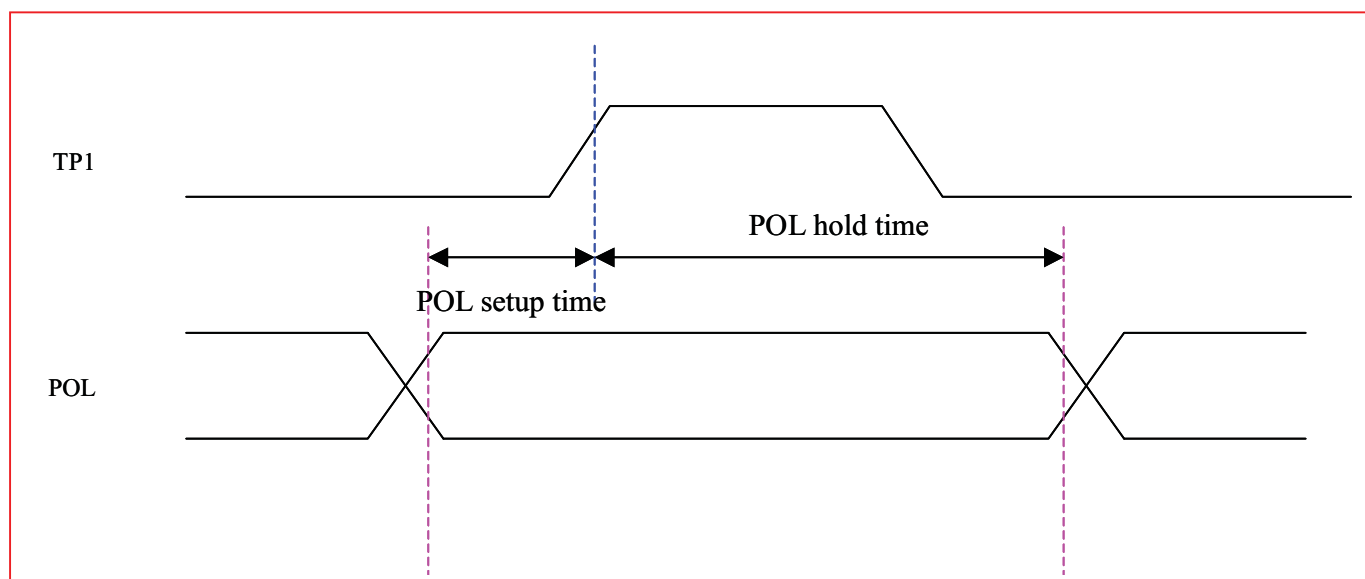
The input signal timing specifications are shown as the following table and timing diagram.

| Signal           | Item                        | Symbol    | Typ           | Unit |
|------------------|-----------------------------|-----------|---------------|------|
| TP1              | TP1 start                   | TP1_STR   | 203           | CLK  |
|                  | TP1 pulse width             | TP1_PW    | 20            | CLK  |
| OE               | OE1 start                   | OE1_STR   | 137           | CLK  |
|                  | OE1 pulse width             | OE1_PW    | 66            | CLK  |
|                  | OE2 start                   | OE2_STR   | 137           | CLK  |
|                  | OE2_PW                      | OE2_PW    | 66            | CLK  |
| Gate shaping     | GVON start                  | GVON_STR  | --            | --   |
|                  | GVON pulse width            | GVON_PW   | --            | --   |
|                  | GVOFF start                 | GVOFF_STR | 70            | CLK  |
|                  | GVOFF pulse width           | GVOFF_PW  | 20            | CLK  |
| STV              | Scan driver start pulse     | STV       | 37            | CLK  |
| CKV              | Scan driver clock           | CKV       | 110           | CLK  |
| POL              | Data driver polarity invert | POL       | 123           | CLK  |
| Data arrangement |                             |           | Flip pixel -1 |      |

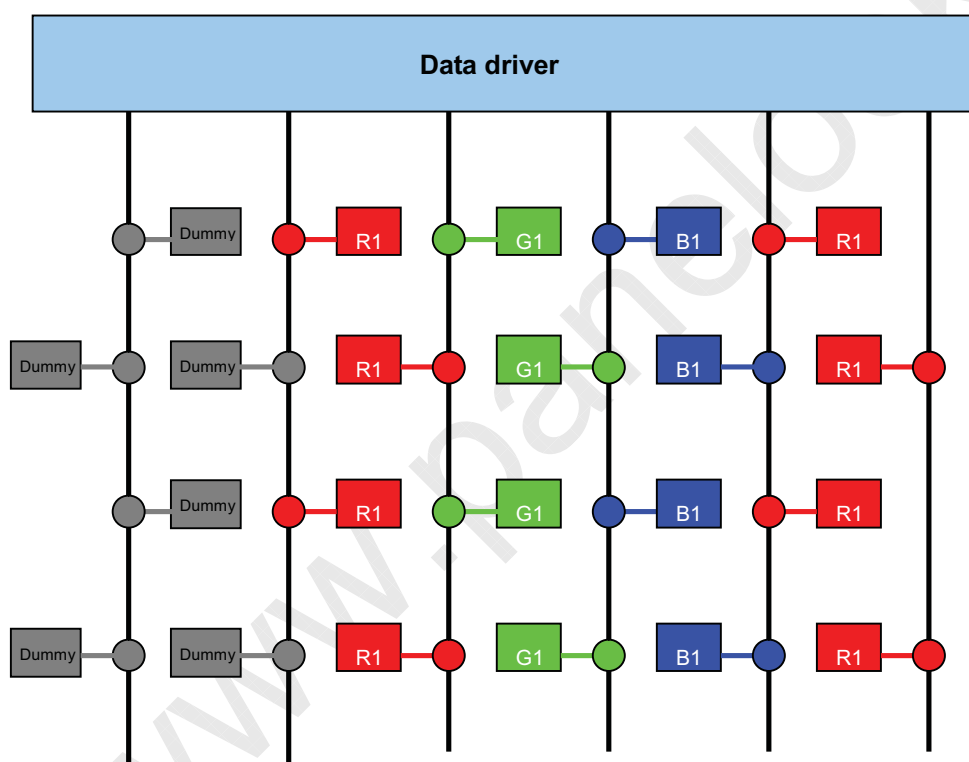








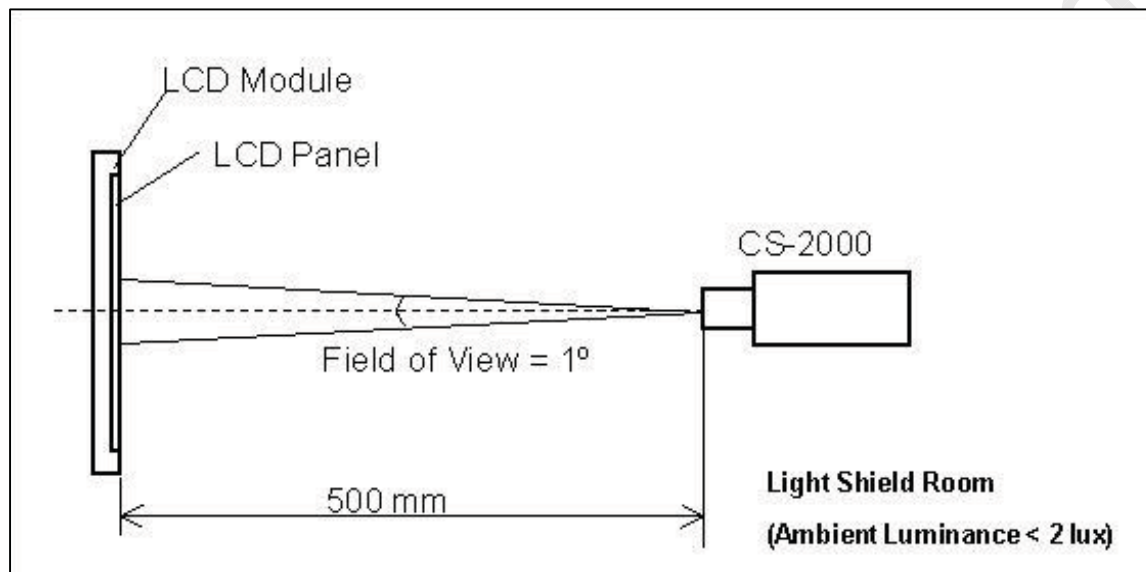
Note: Data arrangement of Flip pixel -1



**6. OPTICAL CHARACTERISTICS****6.1 TEST CONDITIONS**

| Item                | Symbol | Value | Unit |
|---------------------|--------|-------|------|
| Ambient Temperature | Ta     | 25±2  | °C   |
| Ambient Humidity    | Ha     | 50±10 | %RH  |
| Vertical Frame Rate | Fr     | 120   | Hz   |

Note (1) The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.



Note (2) The LCD module should be measured with CMI T-CON code and follow the T-CON spec.



## 6.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 6.1 and stable environment shown in 6.1.

| Item                 |            | Symbol         | Condition                                                                                              | Min. | Typ.  | Max. | Unit | Note    |
|----------------------|------------|----------------|--------------------------------------------------------------------------------------------------------|------|-------|------|------|---------|
| Color Chromaticity   | Red        | Rcx            | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>Viewing Angle at Normal Direction<br>Standard light source “C” | -    | 0.650 | -    | -    | (0)     |
|                      |            | Rcy            |                                                                                                        |      | 0.323 |      | -    |         |
|                      | Green      | Gcx            |                                                                                                        |      | 0.257 |      | -    |         |
|                      |            | Gcy            |                                                                                                        |      | 0.583 |      | -    |         |
|                      | Blue       | Bcx            |                                                                                                        |      | 0.134 |      | -    |         |
|                      |            | Bcy            |                                                                                                        |      | 0.101 |      | -    |         |
|                      | White      | Wcx            |                                                                                                        |      | 0.289 |      | -    |         |
|                      |            | Wcy            |                                                                                                        |      | 0.335 |      | -    |         |
| Center Transmittance |            | T%             | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>with CMI module                                                | -    | 4.8   | -    | %    | (1),(5) |
| Contrast Ratio       |            | CR             |                                                                                                        | 3500 | 5000  | -    | -    | (1),(3) |
| Response Time        |            | T <sub>R</sub> | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>with CMI<br>Module@120Hz,<br>Panel temperature is 34±1℃        | -    | 35    | -    | ms   | (1),(4) |
|                      |            | T <sub>F</sub> |                                                                                                        | -    | 4.5   | -    | ms   |         |
|                      |            | Gray to gray   |                                                                                                        | -    | 5.5   | 12   | ms   | (1),(4) |
| Viewing Angle        | Horizontal | $\theta_{x+}$  | CR≥20<br>With CMI module                                                                               | -    | 88    | -    | Deg. | (1),(2) |
|                      |            | $\theta_{x-}$  |                                                                                                        | -    | 88    | -    |      |         |
|                      | Vertical   | $\theta_{Y+}$  |                                                                                                        | -    | 88    | -    |      |         |
|                      |            | $\theta_{Y-}$  |                                                                                                        | -    | 88    | -    |      |         |

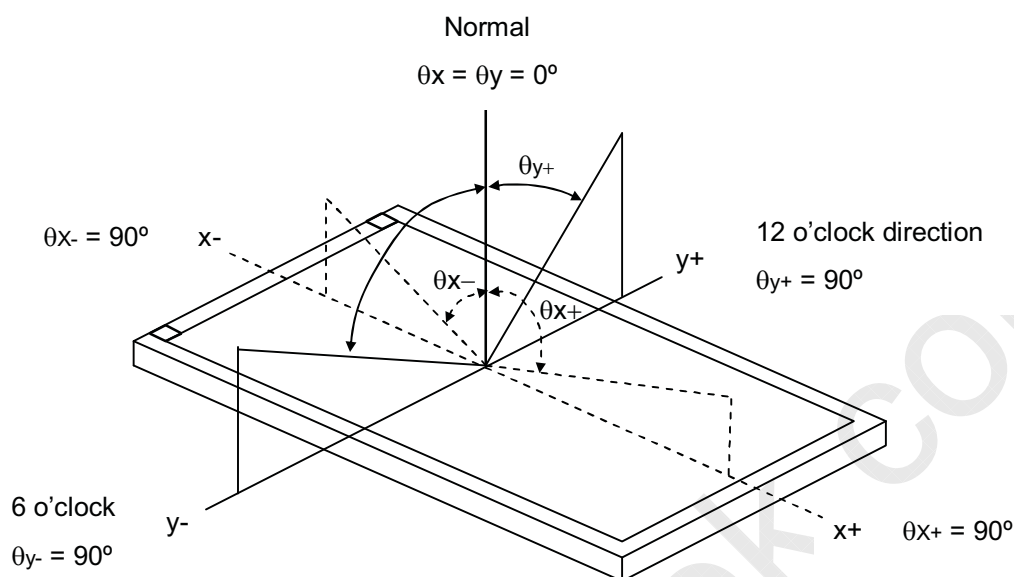
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following:

- 1.Measure Module's W,R,G,B spectrum and BLU's spectrum. Which BLU is supplied by Sony.
- 2.Calculate cell's spectrum.
- 3.Calculate cell's chromaticity by using the spectrum of standard light source "C".

Note (1) Light source is the BLU which supplied by CMI and driving voltage are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle ( $\theta_x$ ,  $\theta_y$ ):

Viewing angles are measured by Autronic Conoscope Cono-80



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

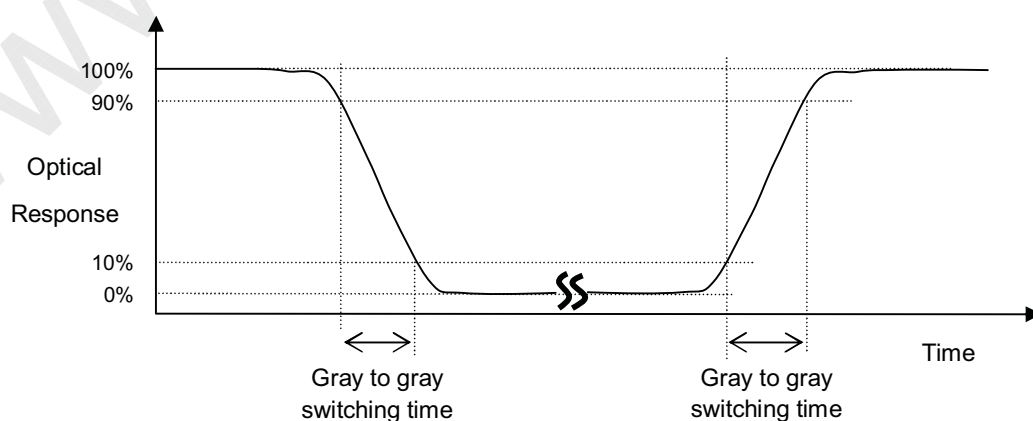
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (X), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (4) Definition of Response Time ( $T_R$ ,  $T_F$ , Gray to Gray) :



The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255



T<sub>R</sub> means switching time from gray 0 to 255

T<sub>F</sub> means switching time from gray 255 to 0

Gray to gray means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255 to each other.

Note (5) Definition of Transmittance (T%) :

Measure the luminance of gray level 255 at center point of LCD module.

$$\text{Transmittance (T\%)} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backligh unit}} \times 100\%$$

**7. RELIABILITY TEST CONDITION**

| NO. | Test Item                        | Test Condition                                                                     |
|-----|----------------------------------|------------------------------------------------------------------------------------|
| 1   | HT Operation                     | Ta=50℃, 1000hrs                                                                    |
| 2   | HT Storage                       | Ta=60℃, 500hrs                                                                     |
| 3   | LT Operation                     | Ta=0℃, 500hrs                                                                      |
| 4   | LT Storage                       | Ta=-20℃, 500hrs                                                                    |
| 5   | HTHH Operation                   | Ta=50℃/ 80%RH, 500hrs                                                              |
| 6   | HTHH Storage                     | Ta=50℃/ 90%RH, 500hrs                                                              |
| 7   | Thermal Shock<br>(Non-operation) | [(-20℃ 30min)→(60℃ 30min)]/cycle, 200cycles                                        |
| 8   | Image Sticking                   | Ta=50℃, 300hrs                                                                     |
| 9   | ESD-Air mode<br>Discharge        | 150pf , 330Ω, ±15KV (operation) Class C ( With CMI Module )                        |
| 10  | ESD-Contact Mode<br>Discharge    | 150pf , 330Ω, ±8KV (operation) Class B ( With CMI Module)                          |
| 11  | Packing Vibration                | 1.14Grms Random frequency 1~200Hz 30min/Bottom, 15min/Right-Left, 15min/Front-Back |
| 12  | Packing Drop                     | Bottom 20cm+ 4 edges with 15 angle                                                 |



**8. PRECAUTIONS****8.1 ASSEMBLY AND HANDLING PRECAUTIONS**

- [ 1 ] Do not apply rough force such as bending or twisting to the module during assembly.
- [ 2 ] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- [ 3 ] Do not apply pressure or impulse to the module to prevent the damage of LCD panel.
- [ 4 ] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- [ 5 ] The distance between COF edge and rib of BLU is suggested to be larger than 5mm, in order to prevent from damage on COF during module assembly.
- [ 6 ] Do not design sharp-pointed structure / parting line / tooling gate on the COF position of plastic parts, because the burr will scrape the COF.
- [ 7 ] If COF would be bended during module assembly, it is suggested not to locate the IC on the bending corner of COF.
- [ 8 ] The gap between COF IC and any structure of BLU is suggested to be larger than 2mm, in order to prevent from damage on COF IC.
- [ 9 ] Bezel opening must have no burr. Burr will scrape the panel surface.
- [ 10 ] It is suggested that bezel of module and bezel of TV set can not press or touch the panel surface. It will make light leakage or scrape.
- [ 11 ] When module used FFC / FPC, but no FFC / FPC to be attached in the open cell. Customer can refer the FFC / FPC drawing and buy it by self.
- [ 12 ] The gap between Panel and any structure of Bezel is suggested to be larger than 2mm, in order to prevent from damage on Panel.
- [ 13 ] Do not plug in or pull out the I/F connector while the module is in operation.
- [ 14 ] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- [ 15 ] Moisture can easily penetrate into LCD module and may cause the damage during operation.
- [ 16 ] When storing modules as spares for a long time, the following precaution is necessary.
  - [ 16.1 ] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C at normal humidity without condensation.
  - [ 16.2 ] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [ 17 ] When ambient temperature is lower than 10°C, the display quality might be reduced.
- [ 18 ] The peeling strength of COF is 200gf/cm.
- [ 19 ] During module assembly process, the static electricity around the environment should be less than 300V.

**8.2 SAFETY PRECAUTIONS**

- [ 1 ] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- [ 2 ] After end of life of the open cell product, it is not harmful in case of normal operation and storage.

## 9. DEFINITION OF LABELS

### 9.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMI internal control.

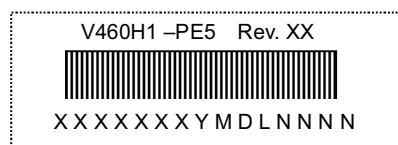
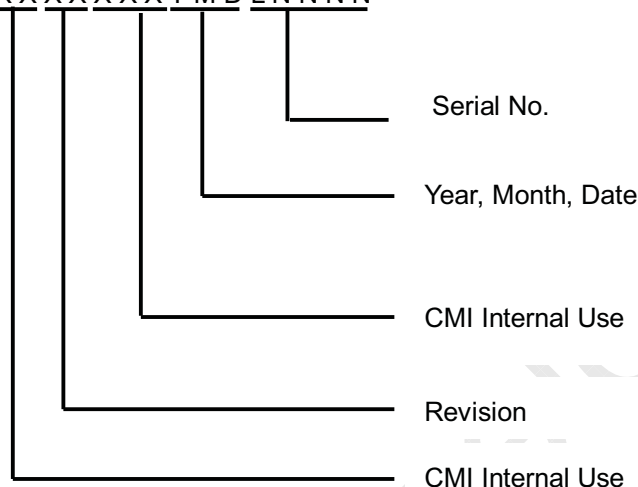


Figure.9-1 Serial No. Label on SPWB and Cell

Model Name: V460H1-PE5

Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

Manufactured Date:

Year: 2010=0, 2011=1, 2012=2...etc.

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O, and U.

Revision Code: Cover all the change

Serial No.: Manufacturing sequence of product

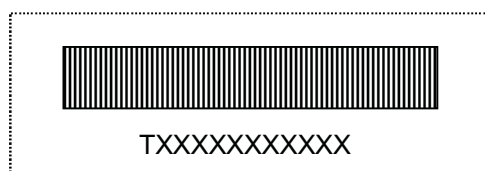
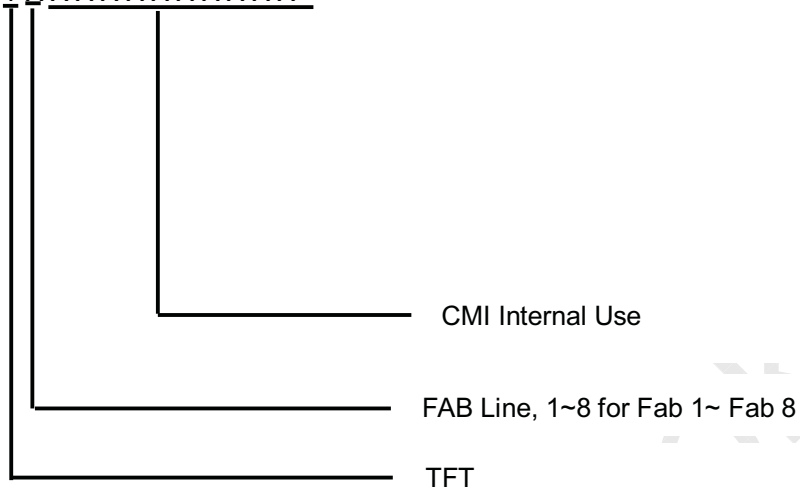


Figure.9-2 Panel ID Label on Cell

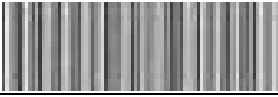
Panel ID Label includes the information as below:

Panel ID: T X X X X X X X X X



## 9.2 CARTON LABEL

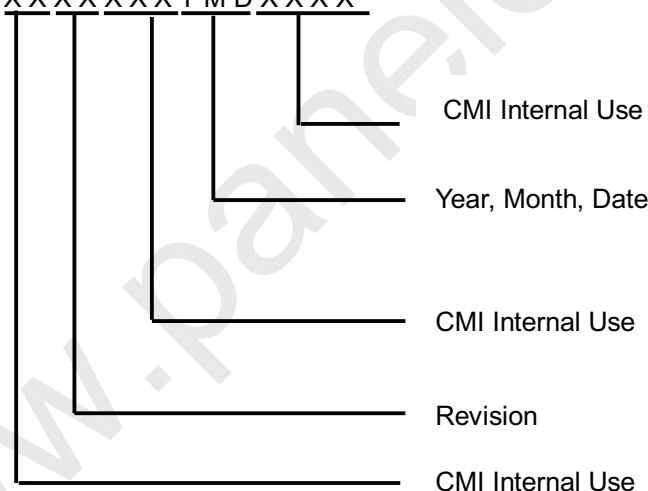
The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation.

|                                |                                                                                                      |
|--------------------------------|------------------------------------------------------------------------------------------------------|
| RoHS                           |                                                                                                      |
| P.O. NO.                       | _____                                                                                                |
| Parts ID.                      | _____                                                                                                |
| Model Name                     | V460H1-PE5                                                                                           |
| Carton ID.                     | <br>XXXXXXXXYMDXXXX |
| Quantities                     | ____                                                                                                 |
| Made In Taiwan (Made In China) |                                                                                                      |

Carton label includes the information as below:

(a) Model Name: V460H1- PE5

(b) Carton ID: X X X X X X Y M D X X X X



Serial ID includes the information as below:

Manufactured Date:

Year: 2010=0, 2011=1, 2012=2...etc.

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O, and U.

Revision Code: Cover all the change

(c) Quantities: 8

## 10. PACKAGING

### 10.1 PACKAGING SPECIFICATIONS

- (1) 8 LCD TV Panels / 1 Box
- (2) Box dimensions :1238 (L) X 842 (W) X 240(H)
- (3) Weight : approximately 38Kg (8 panels per box)
- (4) Desiccant (Drier): Weight 30g / 1 piece, Quantity 6 pcs, Cobalt chloride free.

### 10.2 PACKAGING METHOD

Figures 10-1 and 10-2 are the packing method

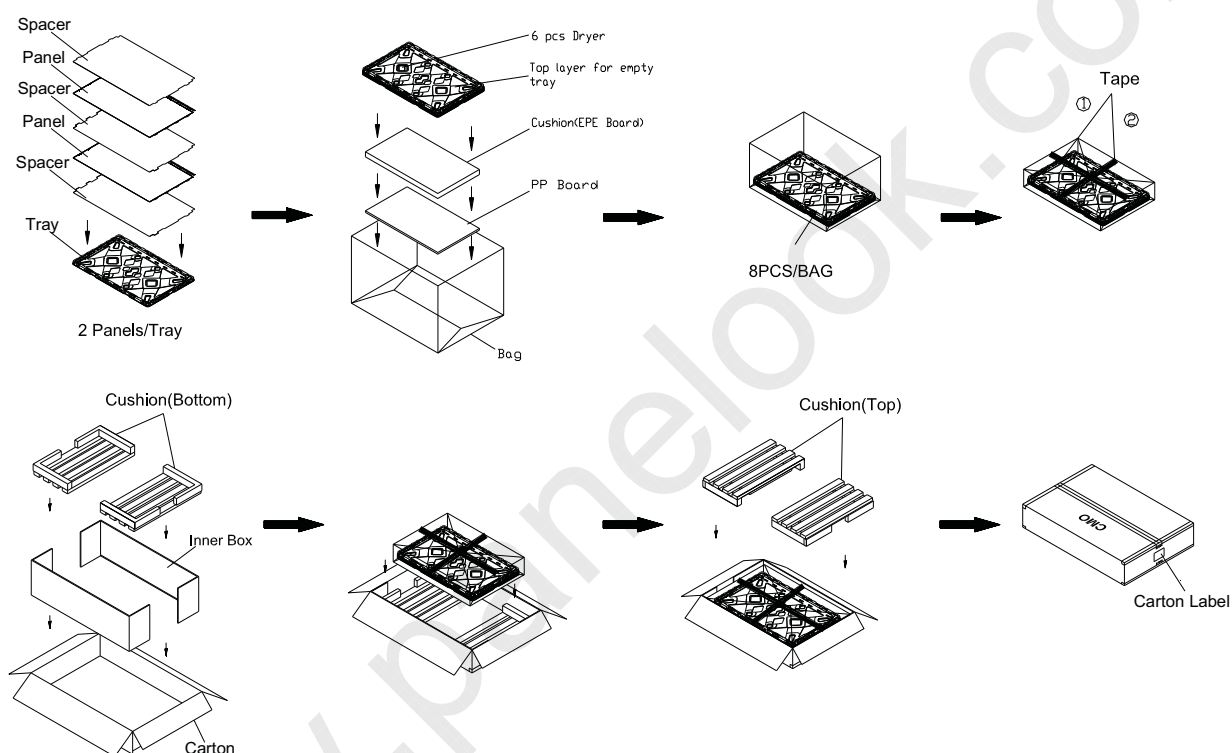


Figure.10-1 packing method

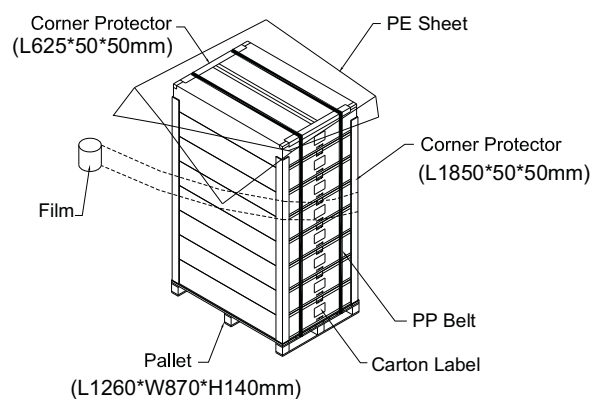
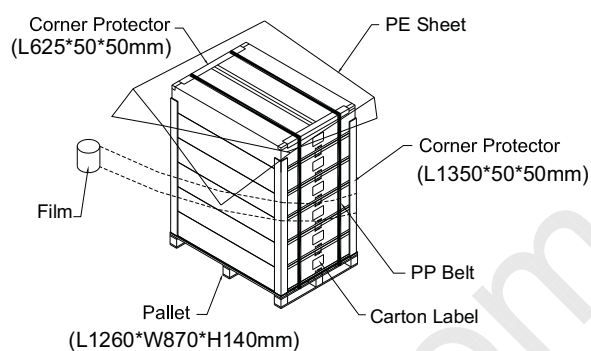
**Sea & Land Transportation****Air Transportation**

Figure.10-2 packing method

## PRODUCT SPECIFICATION

## 11. MECHANICAL CHARACTERISTIC

